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Editors

# Advances in Tourism, Technology and Systems

Selected Papers from ICOTTS 2023,  
Volume 2

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# Preface

This book—*Advances in Tourism, Technology and Systems: Selected Papers from ICOTTS 2023, Volume 2*—from the SIST Series is composed of the best-selected papers accepted for presentation and discussion at the 2023 International Conference on Tourism, Technology and Systems (ICOTTS'23). The ICOTTS is a multidisciplinary conference with a special focus on new technologies and systems in the tourism sector and was held between 2 and 4 November 2023. The ICOTTS'23 was supported by the Anáhuac University, Bacalar, Mexico, and by the International Association for Digital Transformation and Technological Innovation (IADITI).

The International Conference on Tourism, Technologies and Systems is an international forum for researchers and professionals in the tourism sector, which enables the discussion of the latest innovations, trends and concerns in several areas, in the tourism sector, associated with Information Technologies and Systems. It is an event for professionals in the sector, in search of technology solutions, where academics, IT experts and business managers meet to discuss new ideas that help them maximize the potential of tourism business through technology.

The ICOTTS'23 Scientific Committee is composed of a multidisciplinary group of 140 experts who assessed some 298 papers from 24 countries, received for each of the main topics proposed for the conference: (a) Tourism research in providing innovative solutions to social problems; (b) information and communication technologies in hospitality and tourism industry; (c) sustainable tourism; (d) tourism trends; (e) health and wellness tourism; (f) tourism management; (g) marketing strategies in hospitality and tourism industry; (h) hospitality, tourism and foodservice environment; (i) tourism in the different scientific areas; and (j) eTourism and Tourism 2.0.

The papers accepted for presentation and discussion at the conference are published by Springer and will be submitted for indexing by ISI, SCOPUS, EI-Compendex, Google Scholar and Springerlink.

We thank all those who contributed to the ICOTTS'23 conference (authors, committees, workshop organizers and sponsors). We deeply appreciate your involvement and support, which were crucial to the success of the conference.

Porto, Portugal  
November 2023

João Vidal Carvalho  
António Abreu  
Dália Liberato  
José Angel Díaz Rebolledo

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# Backpackers' space-time behaviour in a world heritage City – Porto

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**Abstract.** Urban tourism is one of the most popular forms of tourism, but it remains an understudied phenomenon, particularly in terms of tourists' spatiotemporal behaviour. The aim of this research is to analyse the spatiotemporal behaviour of the backpacker tourists in an urban destination classified as World Heritage. Data collection was done through a questionnaire survey (n=292) and a GPS App to track backpacker tourist movements (n = 82) during a visit day to Porto, Portugal. All the thematic cartography was developed with QGIS 3.2.0 software. A map with the movements performed by all backpacker tourists; a map with the intensity of the backpacker movements (passages by area, 50 x 50 metres) and a map with the distribution of the total length of stay by area (50 x 50 metres), allowed the identification of the main hotspots as well as the non-visited territories in Porto urban area. Relevant contributions for destination managers are presented and discussed.

**Keywords:** Backpackers, Spatiotemporal behaviour, World heritage, Porto.

## 1 Introduction

The aim of this research is to analyse the spatiotemporal behaviour of the backpacker tourists in an urban destination classified as World Heritage. Where tourists go?, what they do?, how long they stay in the visited attractions?, What means of transport do they use?, or which routes do they choose to take?, are some of the many questions that research on the spatiotemporal behavior of tourists has been exploring and answering. According to the literature, research focusing on tourists' spatiotemporal behaviour can give numerous theoretical and managerial contributions, influencing destination planning and management (Beeco et al., 2013; Ferrante et al., 2016); developing support and transport infrastructures, developing tourism products, marketing strategies and commercial viability of tourism activities and the improvement of destinations image (A. M. Caldeira, 2014; Shoval & Ahas, 2016). Studying tourists space-time behaviour can also promote the dispersal of tourists within a region, contributing to generate and redistribute tourism income in the local economy, to manage traffic flows and reduce the negative environmental impacts of tourism (Le-Klähn et al., 2015). Therefore, give relevant contributions to the management of social, environmental and cultural impacts of tourism activity (A. M. Caldeira, 2014; Shoval & Ahas, 2016), namely in urban destinations. In urban destinations with problems related to over tourism and gentrification, such as Barcelona, Venice or Lisbon, can also contribute to a greater dispersion of tourists and to identify the main hotspots, developing effective measures to better manage visitor flows and limit access to specific urban areas (Bauder & Freytag, 2015).

This research was one of the first to study the spatiotemporal behavior of tourists in Portugal using GPS technology (GPS app). The literature review focuses on backpacker tourism and backpacker tourists, and tourists' spatiotemporal behavior. After the description of the methodology used in the data collection and in the construction of the thematic cartography, the analysis and discussion of the results obtained is carried out. Important contributions for those responsible for destination management are presented and discussed in the conclusions.

## 2 Literature Review

### 2.1 Backpacker tourism

In the context of travel among young people, backpacker tourism has assumed relevance and is considered by Cohen(2011) as one of the predominant trends of contemporary tourism, evidenced by the increase in the number of young people travelling annually across the planet (Confederation, 2021). Martins and Costa (2023) highlight the lack of consensus and inconsistencies between scholars due to the lack of a uniform criterion for operationalising the definition of backpacker. For this research "Backpacker tourism comprises the activities carried out by a complex and heterogeneous group of travellers, consisting predominantly of young people who travel for longer periods than usual and with flexible and informal travel itineraries" (Martins & Costa, 2021, p.1). Backpackers are frequently described as predominantly young travellers, with an emphasis on meeting other travellers and with independent and flexible travel

arrangements. They have a preference for longer holidays and are more likely to stay in budget accommodation. Several segments have been identified in the literature (see, for example, Martins and Costa, 2023) however, for operationalisation reasons, and following the Tourism Research Australia (2009, p.1) a backpacker is “a person who spends one or more nights in a backpacker’s house or hostel”.

All tourists are driven by one or more motives when planning and undertaking their trips. In their book "The Psychology of Leisure Travel", Mayo and Jarvis (1981) state that motivation is the ultimate guiding force, characterised by internal motives of a psychological nature, which explains individual actions. Therefore, backpacker tourists are a heterogeneous market (Loker-Murphy & Pearce, 1995; Richards & Wilson, 2004). Oliveira-Brochado and Gameiro (2013) have concluded that there is an emerging diversity and growth in the heterogeneity of backpackers' preferences, who are known as tourists who enjoy different types of experiences during their visits. Backpacking is thus a heterogeneous phenomenon in terms of motivations and meanings. One of the main reasons for travelling backpacker style is to build a new temporary identity while travelling, to be more courageous and independent (E. Cohen, 2003; Elsrud, 2001; O'Reilly, 2006). Several studies also highlight the cultural knowledge as one of the most important motivations for backpackers to travel, with an emphasis on contact, knowledge and understanding of the visited cultures, history and local societies (Chen et al., 2014; Larsen et al., 2011); and the exploration of other cultures associated with increasing knowledge (Hecht & Martin, 2006; Hsu et al., 2014; Paris & Teye, 2010); the search for authenticity is further noted by Gibson and Connell (2003).

Therefore, it is expected that this market segment, known for appreciating different types of experiences during their visits, will look for cultural attractions and activities in the visited destinations, such as museums, artistic and monumental heritage, cultural activities associated with intangible heritage, such as music, gastronomy and wines, among others.

Backpackers often seek greater contact with what is local or typical of the cultures of visited destinations and try to experience local life experiences (E. Cohen, 2003).

## **2.2 Tourists' spatiotemporal behaviour**

If in the past, several researches on the spatial and temporal behaviour of tourists have been carried out in a multi-destination context, i.e. of several destinations, more recently, the tourist movements in the perspective of intradestination trips, especially in urban destinations, have become of interest to several researchers (A. M. Caldeira & Kastenholz, 2018a, 2019; Galí & Aulet, 2019; M. R. Martins et al., 2022; Shoval et al., 2018). But as Hunt and Crompton (2008) point out, most tourist trips are not made to a single attraction in the destination, so it is essential to understand the movements made by tourists in a multi-attraction destination, or in other words, how tourists consume the urban space they visit, from attraction to attraction and from activity to activity (Caldeira, 2014).

Some researchers have also analysed the spatial and temporal behaviour of visitors in enclosed spaces with defined boundaries, i.e. intra-attraction level, where tourist behaviour is much more controllable (Xiao-Ting & Bi-Hu, 2012), such as sports events (Pettersson & Zillinger, 2011), festivals (Yun & Park, 2014), zoos (Xu et al., 2020), among others. Others, explore more the methodologies and the reliability of the data

collection methods. As mentioned by Ferrante et al., (2016), the spatiotemporal behaviour of tourists has been analysed from different perspectives, considering the scale of analysis of the movements performed (inter-destination, intra-destination or intra-attraction); the geographical scale of the visited area; and the main determinants of tourist mobility. Regarding the main determinants of tourist mobility, Grinberger et al., (2014) emphasise those who have focus on destination choices, on tourist experience, on tourist segmentation, and on destination consumption by tourists, also referring to several other factors, such as the cultural origin of tourists (Dejbakhsh et al., 2011), tourists visiting the destination for the first time and repeaters (A. M. Caldeira & Kastenholz, 2018b; Espelt & Benito, 2018), special interests of tourists (Fennel, 1996), the first and last day of visit (Mckercher & Lau, 2008) and the sociodemographic characteristics of tourists, such as age, gender, income and education (A. M. Caldeira, 2014; M. R. Martins, 2020). Other research focuses on tourist satisfaction (A. M. Caldeira, 2014), the impact of distance travelled from the country of origin (A. Caldeira & Kastenholz, 2015) and environmental sustainability (Dickinson et al., 2013; Edwards & Griffin, 2013). Therefore, with few exceptions (M. R. Martins, 2020; M. R. Martins et al., 2022, 2023) no research has yet addressed the spatiotemporal behaviour of backpackers during their visit to an urban World Heritage destination.

### 3 Methodology

Data collection was done through a questionnaire survey (n=292) and a GPS App to track backpacker tourist movements (n = 82) during a visit day. In this analysis it was used the data from the questionnaires of visitors who agreed to have their movements tracked (M. R. Martins, 2020; R. Martins & Costa, 2023). To identify the exact movements and routes followed by the participants, it was used a GPS app available on the market and free of charge (i.e., Open GPS Tracker). The GPS app recorded the distance (km), the time (min), the speed (km/h), the position (latitude and longitude), and the direction of movements. Data collection was carried out in 2017, between July 16 and December 11, in several hostels located in Porto, Portugal. The historic center of Porto was classified in 1996 by UNESCO as a World Heritage site. Porto as a destination offers a wide array of wine tourism experiences, shopping, sightseeing, and pleasure tourism experiences (Martins et al., 2023) and is the main gateway to the north of Portugal where several attractions/destinations can be found: Douro Valley (UNESCO World Heritage), several cities such as Braga, Viana do Castelo and Guimarães (UNESCO World Heritage), National and Natural Parks such as Gerês and Alvão, Foz Côa Archaeological Park (UNESCO World Heritage), among others (Costa et al., 2014). The georeferenced data were analyzed using QGIS 3.12.2 software, a free and open-source geographic information system (GIS). The spatial and temporal analysis of backpacker tourist movements was carried out through: i) the production of a map with the movements made by all the tourists tracked (Fig.1); ii) the production of a map of the intensity of the backpacker movements, through the accounting of their passages by area (50 x 50 metres) as suggested by Shoval (2008); and iii) the production of a map with the distribution of the total length of stay of backpackers by area (50 x 50 metres).

## 4 Analysis of results and discussion

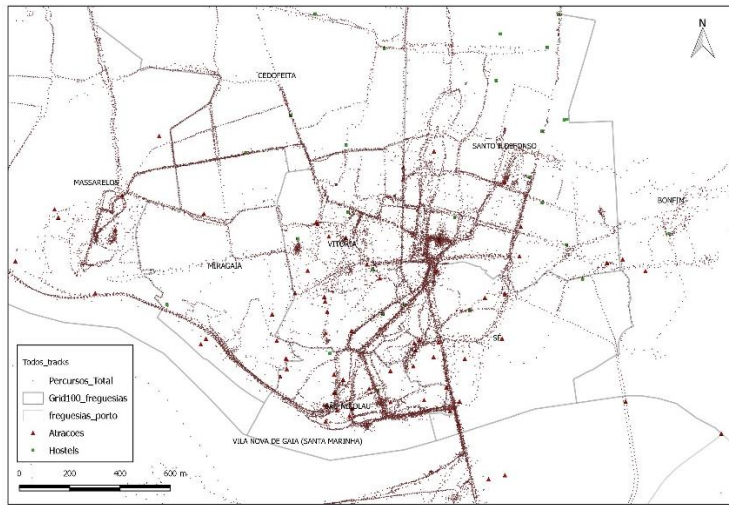
### 4.1 Sociodemographic

Of those who answered the questionnaire (n=292), only 82 backpackers (28%) agreed to successfully track their movements during a day's visit to the city of Porto. Of these, 39 are female (47.6%) and 43 (52.4%) male, mostly single (70.7%) or in a relationship without marriage (22%), having a high level of education (approximately 83% have a higher or postgraduate education), and working full-time (50%) or part-time (9.8%), although the percentage of students is still relevant (29.3%). Being a group of young tourists, with an average age of 26.6 years, annual incomes are relatively high: of the 68 tourists who answered this question, 48.5% stated that they earn an income of more than 20 thousand euros per year. Regarding nationality, the vast majority come from European countries (68.3%) with Germany being the most represented country, followed by countries from America (23.2%) and East Asia and Pacific (8.5%) where Australia stands out.

Many backpackers who agreed to do GPS tracking with their smartphone are long-term backpackers (25.6%) and Flashpackers (25.6%). They are followed by global nomads with 17.1% and short-term backpackers with 12.2% (see Martins, 2020 for more details). The remaining sub-segments have little representation. Given the great diversity of backpacker sub-segments and the small number of individuals belonging to them, it was considered pertinent to group them into the following typologies, according to Martins & Costa (2023) proposal: short-term backpackers (n=39) which also included Party backpackers and Study backpackers; long-term backpackers (n=8) which also included backpackers who are doing volunteering, Gap Year Backpackers and University Gap Traveller; technological backpackers (n=21) which included Flashpackers and Holiday Backpackers; and more travelled backpackers (n=14) who correspond to Global Nomads.

#### 4.2 Spatiotemporal analysis

Figure 1 shows all the routes traced in the most central parishes of the municipality of Porto. Backpacker movements reveals a distribution of tourists through the main streets of the city, with a higher concentration in the most central areas, where the main attractions are located, namely in the parishes of Santo Ildefonso, Vitória, Sé, São Nicolau, Cedofeita, Miragaia and the parish of Santa Marinha in Vila Nova de Gaia.



Source: Martins (2020).

**Fig. 1.** Backpacker tourist movements tracked in the urban center of Porto

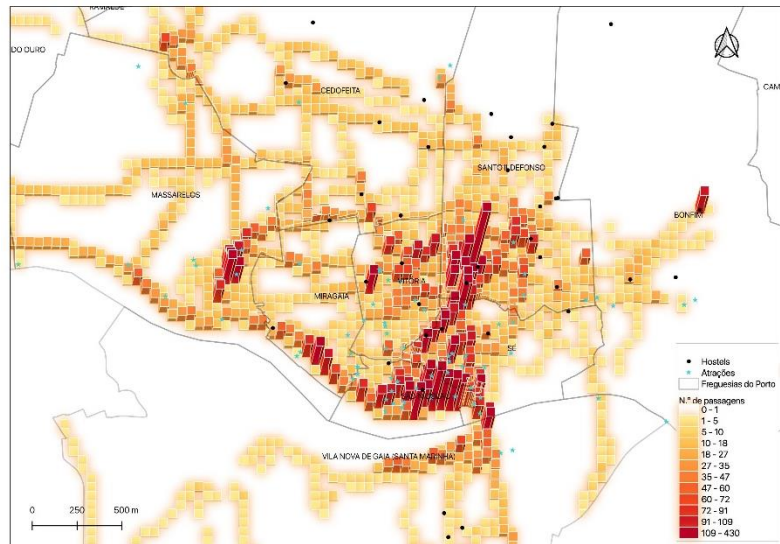
Comparing the routes network with the main attractions of the city, there is a greater incidence of movements in the D. Luís bridge, the Sé do Porto, the Infante house, the Palácio da Bolsa, Ferreira Borges Market, São Bento Station, Bolhão Market, and the gardens of the Palácio de Cristal. Porto is known for its rich heritage and therefore its visit is based on the visit to monuments, as demonstrated by Espelt & Benito (2018). The focus of tourist concentration is undoubtedly the Praça da Liberdade/Aliados where the Nice Way hostel is located, accommodation of many participants in this research (Fig.1 and Fig.2). The most distant parishes from the historic center reveal a decrease in the tourist movements density, with the parishes located on the northern edge of the municipality having a reduced number of visits, or even none, as is the case of Aldoar. As it happened in Lisbon, in Caldeira's research (2014), also in Porto seems to be a coincidence in the distribution of the network of routes "which becomes more open as we move away from the city centre to its periphery and from there to the metropolitan area" (p.267).

In addition to the number of tourist attractions not being very relevant in areas further away from the historic centre of Porto, the public transport network, especially the Metro, does not guarantee the same accessibility to the whole city. As there is an inter-relationship between the mode of transport and the spatial extent of tourists' visits (Le-

Klähn et al., 2015) it is not difficult to explain a higher intensity of visits in areas served by metro stations. The urban layout of the classified area, with medieval characteristics, is marked by very narrow and irregular streets that lead tourists to two wider areas: the Praça da Liberdade/Aliados and Praça da Ribeira. When tourists have not explored the more winding streets of Sé, they follow Rua Mouzinho da Silveira or Rua das Flores, which are the main access routes between downtown and Ribeira. The high concentration of attractions in this area also leads to tourists travelling the same streets several times throughout the day, contributing to increased congestion. The concentration of movements/tours in the main streets is a trend in monumental cities (Espelt & Benito, 2018). These researchers also suggest that the edges or peripheral streets of historic centers and the connection nodes are logically related since the most frequent routes have origins in the main nodes (Espelt & Benito, 2018, p.57). Therefore, nodes and attractions located on these routes are more likely to be visited than those located off the main routes. It is therefore crucial, to ensure and facilitate sustainable mobility, that planning and territorial management measures are applied to contribute to the dispersion of tourists. The provision of an efficient public transport system that serves the entire municipality of Porto with the same level of accessibility could contribute to a greater dispersion of the accommodation offer and the location of new attractions or relocation of some existing ones.

Another aspect to consider when analysing the movements and routes taken by tourists (Fig.1 and Fig.2) is the emergence of possible conflicts with residents, since both locals and tourists share the same spaces. The morphology of the historic centre of Porto, marked by the existence of narrow streets with steep slopes, and the presence of Douro River, represent a morphological barrier making it difficult for tourists to disperse, favoring the existence of conditions for the emergence of overcrowded areas. This can result in more noise, more waste production and greater congestion of public transport.

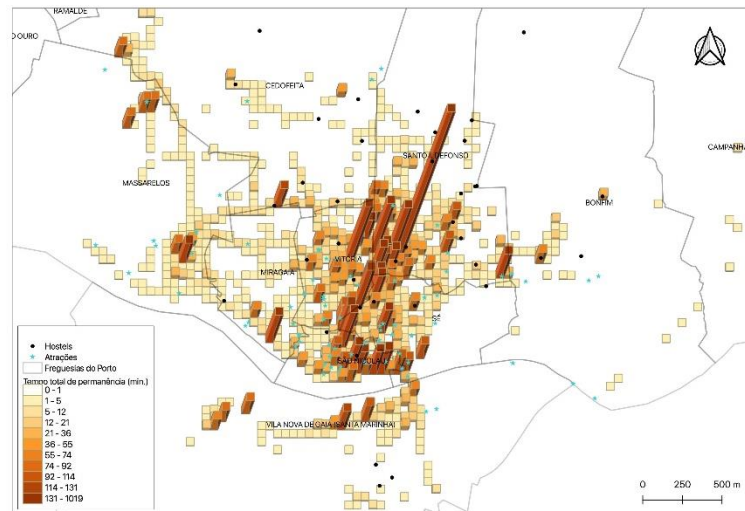
Regarding the time spent in each parish by the tracked tourists (Fig. 3), it coincides with the distribution of the routes taken by them (Fig.1). Zuzanek (1980) cited by Fennell (1996, p.815) defines time budget as "a method of measuring the duration and sequence of activities performed by an individual during a specific period of time, usually 24 hours". In this research, the time budget corresponds to the time that tourists have available to devote to their visit, and as it is not an unlimited resource, it must be well used. As the city of Porto, namely its historic centre where the largest concentration of attractions is located, has a relatively small area, it is not necessary to travel long distances to visit it. Therefore, walking is the most popular means of locomotion among those who visit the city, which is why local authorities responsible for managing tourism activity should be aware, as tourists come into direct contact with the life and cultural aspects of residents and influence the city's economy, culture, and environment (Yun et al., 2018). As most of the time budget dedicated to visiting the city is concentrated in a relatively small area (former parishes of Santo Ildefonso, Sé, São Nicolau and Vitória), characterised by its narrow streets and irregular orography, the increasing number of visitors will contribute to the overcrowding of these areas, contributing to the emergence of problems in terms of the quality of visits and possible conflicts between residents and tourists. It is therefore important to provide the city with infrastructures suited to the needs of those who visit it on foot and to promote an adequate distribution of visitors.



Source: Martins (2020).

**Fig. 2.** Intensity of backpacker tourist movements - number of passages per area (50x50m) in the World Heritage area of Porto.

In Fig. 2 can be observed a higher incidence of movements in the parishes of the historic centre classified by UNESCO as a World Heritage Site, along Praça da Liberdade, Aliados, Rua Mouzinho da Silveira and Rua das Flores. These streets are an important circulation corridor to access the Ribeira do Porto, not forgetting the corridor connecting the Ribeira square, D. Luís bridge and the Cais de Gaia. The Sé Cathedral and the D. Luís bridge, together with the Cais de Gaia, also reveal a large number of backpacker passages. Other secondary host spots are the garden of the Palácio de Cristal, Rua de Cedofeita and Rua de Miguel Bombarda (art galleries) and the well-known Boavista roundabout where the emblematic Casa da Música is located.



Source: Martins (2020).

**Fig. 3.** Total length of stay of backpackers in the World Heritage area of Porto (50mx50m)

The places where backpackers spent more time correspond, in general, to the places with the highest intensities of passages (Fig. 3): Aliados, Praça da Liberdade, Rua Mouzinho da Silveira, Rua das Flores and Ribeira do Porto. Occasionally, there are high lengths of stay in some places close to some attractions and accommodation. Among the attractions, the following stand out: Sé Cathedral, São Lázaro Garden, São Bento Station, D. Luís Bridge, Misericórdia do Porto Church, Clérigos Tower, the Gardens of Palácio de Cristal, Porto and Gaia riverside, Bom Sucesso Market and Casa da Música. Occasionally, there are small territories with average stay times of more than 31 minutes, scattered throughout the city and not coinciding with the location of attractions. These areas correspond mainly to places where cafés, restaurants or hostels are located where breaks for meals, drinks, rest, among others, justify higher average stops. In addition, places close to some viewpoints, Casa da Música and the Gaia River also have higher averages (Fig. 3).

Most backpackers visiting Porto made stops of less than 5 minutes, in line with the results obtained by Yun et al. (2018) where 98% of the stops made by the individuals lasted less than three minutes. Backpackers use the main city streets to move between attractions, revealing a low utilisation of their time budgets when visiting attractions, apart from Casa da Música. The city streets were thus used for circulation without significant stops or experiences (Yun et al., 2018).

### 3 Conclusions

Literature reveal that backpackers appreciate different types of experiences during their visits, looking for cultural attractions and activities such as museums, artistic and monumental heritage, cultural activities associated with intangible heritage, such as music, gastronomy and wines, among others. This research shows that in a urban

context backpackers have a preference for visit the main monuments located in the historic centre, using the main city streets to move between attractions. Backpackers have a low utilisation of their time budgets when visiting attractions, preferring to walk around. It is interesting to note that the longest average stay times do not coincide with the location of attractions. Backpackers spend more time in cafés, restaurants or close to hostels for meals, drinks or rest. In addition, places close to some viewpoints, the Casa da Música and the Cais de Gaia also have higher averages of length of stay.

This research can give important practical contributions do Porto Destination Management Organization (DMO). As walking is the most popular means of locomotion among those who visit the city, local authorities should pay special attention to the tourism impacts in the resident's day life and in the influence of tourists in the city's economy, culture, and environment. As most of the time budget dedicated to visit the city is concentrated in a relatively small area (former parishes of Santo Ildefonso, Sé, São Nicolau and Vitória), characterised by its narrow streets and irregular orography, the increasing number of visitors will contribute to the overcrowding of these areas, and to the emergence of problems related with visitors' satisfaction and possible conflicts between residents and tourists. It is therefore important to provide the city with infrastructures suited to the needs of those who visit it on foot and to promote an adequate distribution of visitors.

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